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(71) Applicant(s)
Mongoose (Australia) Pty. Limited

(54) Inventor(s)
Name not given

p00001-cap
Section 29

AUSTRALIA

Patents Act, 1990

PATENT REQUEST: STANDARD PATENT/PATENT OF ADDITION

I/We, being the person(s) identified below as the Applicant, request the grant of a patent to the person identified below as the Nominated Person, for an invention described in the accompanying standard complete specification. Full application details follow.

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[70]	NOMINATED PERSON: ADDRESS:	AS ABOVE
[54]	INVENTION TITLE:	IMPROVEMENTS IN VEHICLE SECURITY
[72]	NAME(S) OF ACTUAL INVENTOR(S):	
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	ATTORNEY CODE:	MX

ASSOCIATED PROVISIONAL APPLICATION(S) DETAILS

[60]	Application No(s)	Date(s)
	PL 4647	10th September, 1992

Drawing number recommended to accompany the abstract: Fig. 1.

S 040422 100993

DATED this 10th day of September, 1993.

MONGOOSE (AUSTRALIA) PTY. LIMITED
By their Patent Attorneys,
PETER MAXWELL & ASSOCIATES

AU9346299

(12) PATENT ABSTRACT (11) Document No. AU-A-46299/93
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IMPROVEMENTS IN VEHICLE SECURITY

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An ignition security apparatus 10 comprising an ignition key 13 including both mechanical and electrical coding. The mechanical coding allows the key to operate within an ignition barrel 12 in a conventional manner. In addition the electrical coding of the key permits electrical operation of the vehicle ignition only if the electrical code of the key 13 matches with a predetermined code stored in a control module 18.

The key 13 contains no on board stored electrical power source. It receives electrical power at the time that the key 13 is inserted in ignition barrel 12 by means of a loosely coupled transformer arrangement wherein the primary winding of the transformer forms part of the ignition barrel 12 and the secondary winding 21 forms part of the ignition key 13.

.../2

CLAIM

1. A vehicle security system comprising a car ignition circuit adapted to receive a car ignition key, said key including both mechanical coding and electrical coding whereby said ignition system will enable said vehicle to start only when both said mechanical code and said electrical code are ascertained as correct by said vehicle security system.

9. A control module for use in association with an electrically and mechanically coded vehicle ignition key, said control module communicating electrical energy to said key by means of a loosely coupled transformer (said transformer having a primary winding associated with the ignition barrel of a vehicle and having a secondary winding associated with said key), wherein, upon electrical energisation of said key by said loosely coupled transformer said key is caused to radiate an RF signal modulated with a predetermined electrical code for reception and certification by said control module.

p00011
Regulation 3.2

AUSTRALIA

Patents Act, 1990

COMPLETE SPECIFICATION

FOR A STANDARD PATENT

Original

TO BE COMPLETED BY THE APPLICANT

NAME OF APPLICANT:	MONGOOSE (AUSTRALIA) PTY. LIMITED (ACN 002 370 881)
ACTUAL INVENTOR(S):	
ADDRESS FOR SERVICE:	Peter Maxwell & Associates Blaxland House, Suite 10, 5 Ross Street, NORTH PARRAMATTA NSW 2151
INVENTION TITLE:	IMPROVEMENTS IN VEHICLE SECURITY
DETAILS OF ASSOCIATED PROVISIONAL APPLICATION NO(S):	PL 4647 filed 10th September, 1992

The following statement is a full description of this invention, including the best method of performing it know to me:-

The present invention relates to vehicle security and, more particularly, to arrangements for ensuring that only authorised persons can start any given vehicle.

It is viewed as desirable to minimize vehicle theft. A difficulty in achieving this aim in the prior art is to maintain ease of use by authorised persons whilst increasing the security level of the vehicle so that only authorised persons can start the vehicle.

It is an object of the present invention to address this problem.

Accordingly, in one broad form of the invention, there is provided a vehicle security system comprising a car ignition circuit adapted to receive a car ignition key, said key including both mechanical coding and electrical coding whereby said ignition system will enable said vehicle to start only when both said mechanical code and said electrical code are ascertained as correct by said vehicle security system.

Preferably said key does not require an electrical energy storage device on it.

Preferably said key does not require an electrical conduction path between said key and a vehicle ignition switch in order to cause said electrical code of said key to be operative.

Preferably said vehicle security system includes an ignition key, an ignition key barrel adapted to receive said ignition key and control module means electrically connected to said ignition barrel, said key including mechanical coding

whereby said key will rotate the lock assembly of said barrel only if said mechanical coding correctly matches with said barrel; and whereby said control module means will permit electrical operation of the vehicle ignition system only if an electrical code contained within said key matches with a predetermined code contained within said control module.

The control module performs three main tasks:

(1) energise the key electronics when accessories is On;

(2) listen for radio frequency code transmission from key;

(3) upon detecting correct code:

(a) allow vehicle to start;

(b) stop energising the key;

(c) wait until accessories and ignition are Off;

(4) when (3c) true, rearm the system (disable the engine).

The control module energises the electronic key via a set of primary and secondary coils, the primary coil is in the ignition key barrel assembly and the secondary coil is in the electronic key itself.

The electronic key can therefore be 100% sealed in a plastic moulding. This moulding can be clipped to the mechanical ignition key.

In a further broad form of the invention there is provided an electrically and mechanically coded key for operation with a vehicle ignition system as described above.

In a further broad form of the invention there is provided a control module for use in association with an electrically and mechanically coded vehicle ignition key, said control module communicating electrical energy to said key by means of a loosely coupled transformer (said transformer having a primary winding associated with the ignition barrel of a vehicle and having a secondary winding associated with said key), wherein, upon electrical energisation of said key by said loosely coupled transformer said key is caused to radiate an RF signal modulated with a predetermined electrical code for reception and certification by said control module.

Embodiments of the invention will now be described with reference to the accompanying drawings wherein:-

Fig. 1 is a sectional view of a vehicle incorporating ignition security apparatus according to a first embodiment of the invention,

Fig. 2 is a side section view through the ignition key barrel and key of Fig. 1,

Fig. 3 is a schematic diagram of the control module of the ignition security apparatus of Fig. 1,

Fig. 4 is an electrical schematic diagram of the electronic security components mounted on the key of Fig. 1,

Fig. 5 is a logic flow chart for the microcontroller forming part of the control

module of Fig. 2.

With reference to Fig. 1 there is shown ignition security apparatus 10 located within a vehicle 11.

The ignition security apparatus 10 comprises an ignition barrel 12 adapted to receive an ignition key 13. The key 13 includes a mechanical coding arrangement comprising bittings 14 which permit rotation of the key 13 upon insertion within ignition slot 15 of said ignition barrel 12 only if the bittings 14 are of a predetermined shape unique to the key and barrel combination.

Key 13 further includes an RF transmitter 16 embedded within a plastic case 17 forming the grippable portion of the key 13.

The ignition security apparatus 10 further includes a control module 18 in electrical communication with vehicle starter relay 19.

The control module 18 is in electrical communication with the barrel 12 and in RF radio communication with the RF transmitter 16 mounted on key 13. Furthermore RF transmitter 16 receives electrical power from control module 18 by means of a loosely coupled transformer having a primary winding 20 arranged to form part of the key abutting portion of barrel 12 and a secondary winding 21 arranged to form part of the barrel abutting portion of the key 13.

The relative positioning of the two coils forming the windings of the loosely coupled transformer are best seen in cross section in Fig. 2 when the key 13 is fully inserted within barrel 12 the windings 20, 21 approach within

approximately one millimetre of each other which provides sufficient coupling for coils constructed as generally shown in Fig. 2 and when excited at a frequency of between 10 and 11 kHz to impart sufficient electrical power to the RF transmitter 16 for the purposes of RF communication with control module 18.

With reference to Fig. 3 the control module 18 includes as its primary components a receiver antenna 22 connected to a decoder 23 which, in turn, communicates with a microcontroller 24.

The microcontroller 24 additionally receives information as to the state of the ignition barrel 12 by means of "accessory" position input 25 and "ignition" positioned input 26.

The control module 18 further includes a transistor oscillator circuit 27 adapted to be connected to and to excite primary winding 20 with a plus/minus 12 volt signal at a frequency of around 10 to 11 kHz. Microcontroller 24 controls the state of output relay 28, the contacts of which form part of the normal ignition circuit of the vehicle.

The arrow of transmitter circuit 16 is shown in detail in Fig. 4. It is powered from secondary winding 21. The 10 to 11 kHz signal received by the secondary winding 21 from primary winding 20 is half way rectified by a network comprising a diode, a capacitor and a zener diode as illustrated. The rectified power is fed to encoder chip 29 which chip, in turn, modulates an RF signal with a series of square wave pulses whose characteristics are uniquely

determined by the settings of an encoder switch 31.

With reference to both Figs. 3 and 4 the decoder 23 of the control module 18 is programmed to receive and recognise the unique code generated by encoder 29 according to the settings of encoder switch 31. Upon receipt of the correct code, the code is passed to microcontroller 24 which, in turn, energises relay 28 thereby allowing starter relay 19 of the vehicle to be energised so that the vehicle engine can be started.

The overall logic of operation of the microcontroller 24 is shown by the logic flow diagram of Fig. 5.

The salient logic is as follows:-

The control module monitors the accessories line and when it is high, it energises the primary coil to the electronic key assembly. The secondary coil in the electronic key is followed by a rectifier which supplies the electronic key with DC for its operation. The electronic key transmits a security code immediately it is powered up. The control module receives the security code and allows the engine to start. This process typically takes 250 milliseconds. It also then powers down the primary coil. This system is reset when both the accessories and ignition lines are low, once again preventing the engine from starting.

Stated in another way the control module performs three main tasks:

The control module performs three main tasks:

(1) energise the key electronics when accessories is On;

(2) listen for radio frequency code transmission from key;

(3) upon detecting correct code:

(a) allow vehicle to start;

(b) stop energising the key;

(c) wait until accessories and ignition are Off;

(4) when (3c) true, rearm the system (disable the engine).

The control module energises the electronic key via a set of primary and secondary coils, the primary coil is in the ignition key barrel assembly and the secondary coil is in the electronic key itself.

The electronic key can therefore be 100% sealed in a plastic moulding. This moulding can be clipped to the mechanical ignition key.

The encoder/decoder chip combination can be the motorola MC 145026 encoder and 145027 family. The microcontroller 24 can be a motorola 68HC705K1 microcontroller.

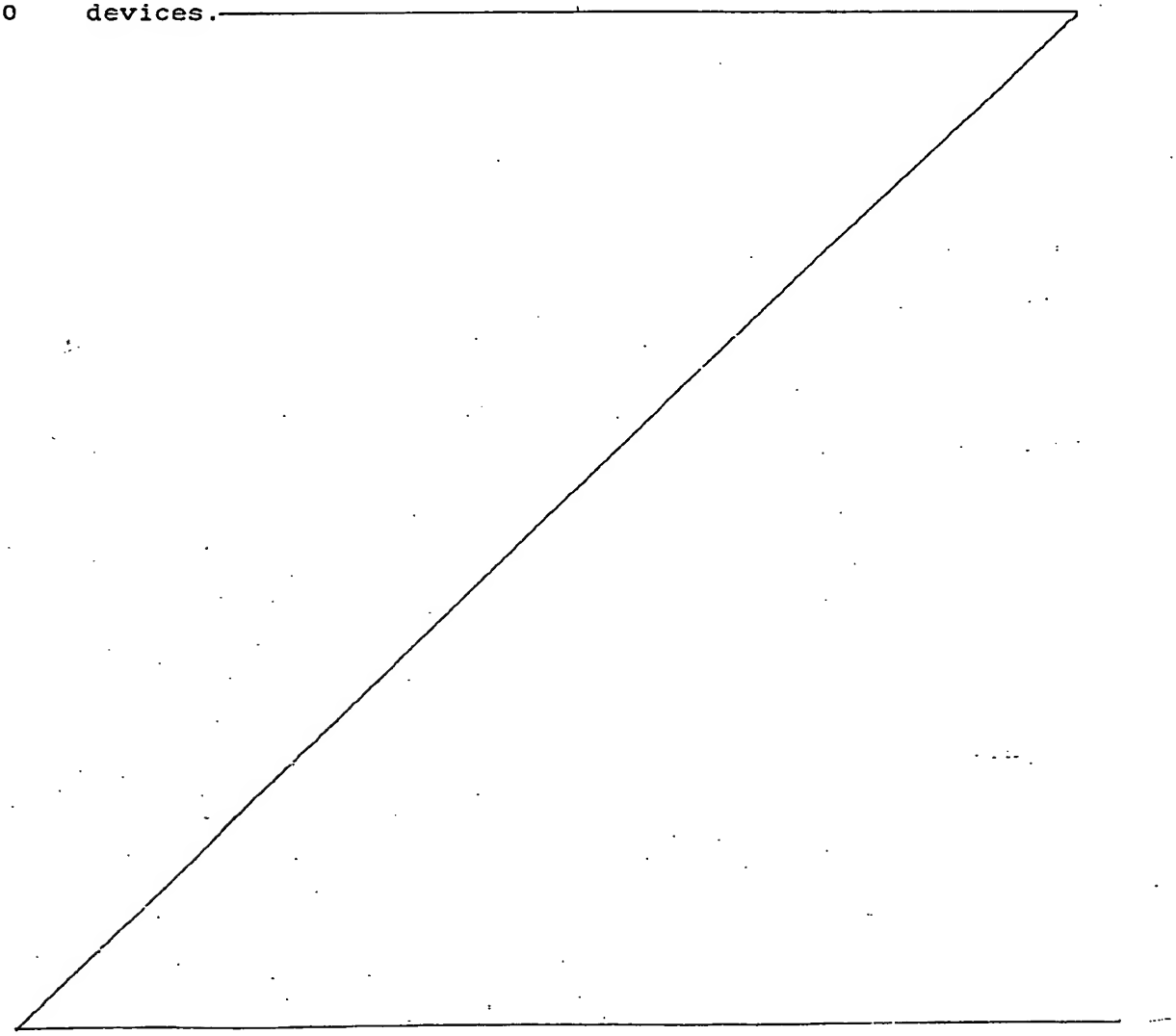
The above describes only some embodiments of the present invention and modifications, obvious to those skilled in the art can be made thereto without departing from the scope and spirit of the present invention.

For example microcontroller 24 can communicate via an encoded message sequence with an engine control management

module (ECM) as commonly used nowadays to control engine functions including engine ignition.

Also the decoding function performed by proprietary chips can be programmed to be performed by the microcontroller 24 instead.

Whilst RF signals have been proposed for the communication medium between the ignition key 13 and the control module 18, other communication technologies can be used, such as those based on surface acoustic wave (SAW) devices.



THE CLAIMS DEFINING THE INVENTION ARE AS FOLLOWS:

1. A vehicle security system comprising a car ignition circuit adapted to receive a car ignition key, said key including both mechanical coding and electrical coding whereby said ignition system will enable said vehicle to start only when both said mechanical code and said electrical code are ascertained as correct by said vehicle security system.

2. The system of claim 1 wherein said key does not require an electrical energy storage device on it.

3. The system of claim 1 or claim 2 wherein said key does not require an electrical conduction path between said key and a vehicle ignition switch in order to cause said electrical code of said key to be operative.

4. The system of claim 1, 2 or 3 wherein said vehicle security system includes an ignition key, an ignition key barrel adapted to receive said ignition key and control module means electrically connected to said ignition barrel, said key including mechanical coding whereby said key will rotate the lock assembly of said barrel only if said mechanical coding correctly matches with said barrel; and whereby said control module means will permit electrical operation of the vehicle ignition system only if an electrical code contained within said key matches with a predetermined code contained within said control module.

5. The system of claim 4 wherein said control module performs three main tasks:

(1) energise the key electronics when accessories is On;

(2) listen for radio frequency code transmission from key;

(3) upon detecting correct code:

(a) allow vehicle to start;

(b) stop energising the key;

(c) wait until accessories and ignition are Off;

(4) when (3c) true, rearm the system (disable the engine).

6. The system of claim 4 or claim 5 wherein the control module energises the electronic key via a set of primary and secondary coils, the primary coil is in the ignition key barrel assembly and the secondary coil is in the electronic key itself.

7. The system of claim 4, 5 or 6 wherein the ignition key electronics is sealed in a plastic moulding and the moulding is clipped to the mechanical ignition key.

8. An electrically and mechanically coded key for operation with a vehicle ignition system as described in any preceding claim.

9. A control module for use in association with an electrically and mechanically coded vehicle ignition key, said control module communicating electrical energy to said key by means of a loosely coupled transformer (said transformer having a primary winding associated with the ignition barrel of a vehicle and having a secondary winding

associated with said key), wherein, upon electrical energisation of said key by said loosely coupled transformer said key is caused to radiate an RF signal modulated with a predetermined electrical code for reception and certification by said control module.

10. A vehicle security system as hereinbefore particularly described with reference to what is shown in the accompanying drawings.

Dated this 10th day of September, 1993.

MONGOOSE (AUSTRALIA) PTY. LIMITED
By their Patent Attorneys
PETER MAXWELL & ASSOCIATES

ABSTRACT

An ignition security apparatus 10 comprising an ignition key 13 including both mechanical and electrical coding. The mechanical coding allows the key to operate within an ignition barrel 12 in a conventional manner. In addition the electrical coding of the key permits electrical operation of the vehicle ignition only if the electrical code of the key 13 matches with a predetermined code stored in a control module 18.

The key 13 contains no on board stored electrical power source. It receives electrical power at the time that the key 13 is inserted in ignition barrel 12 by means of a loosely coupled transformer arrangement wherein the primary winding of the transformer forms part of the ignition barrel 12 and the secondary winding 21 forms part of the ignition key 13.

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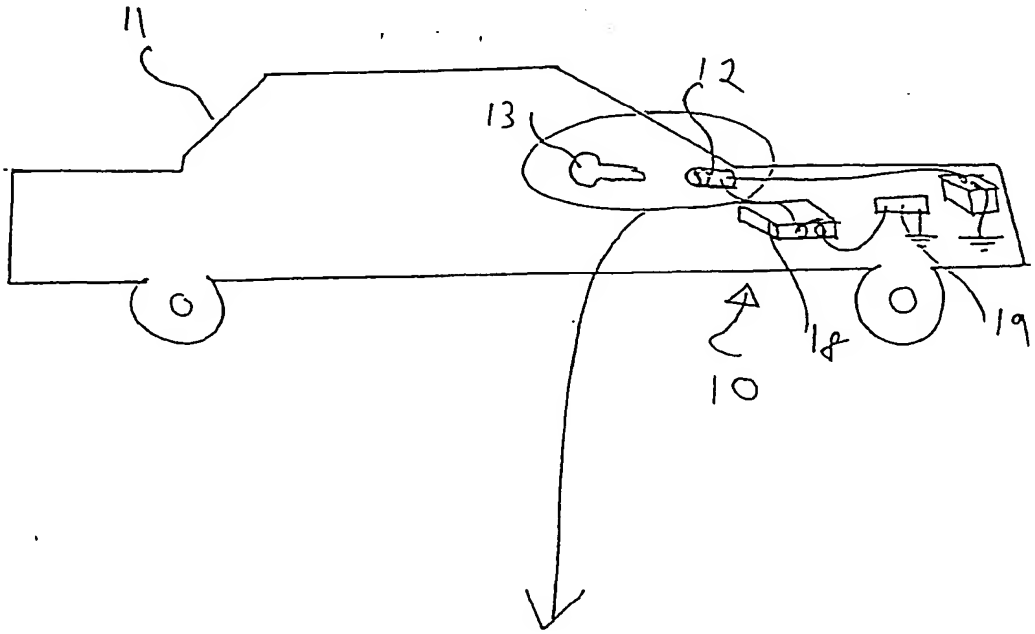


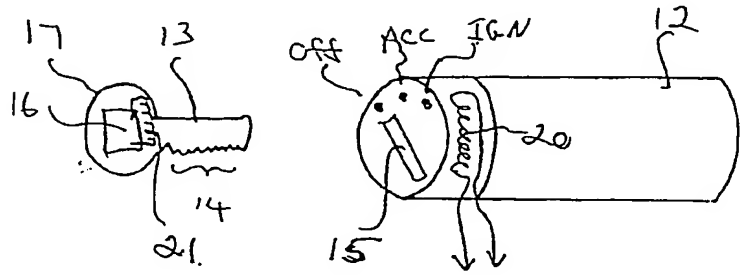
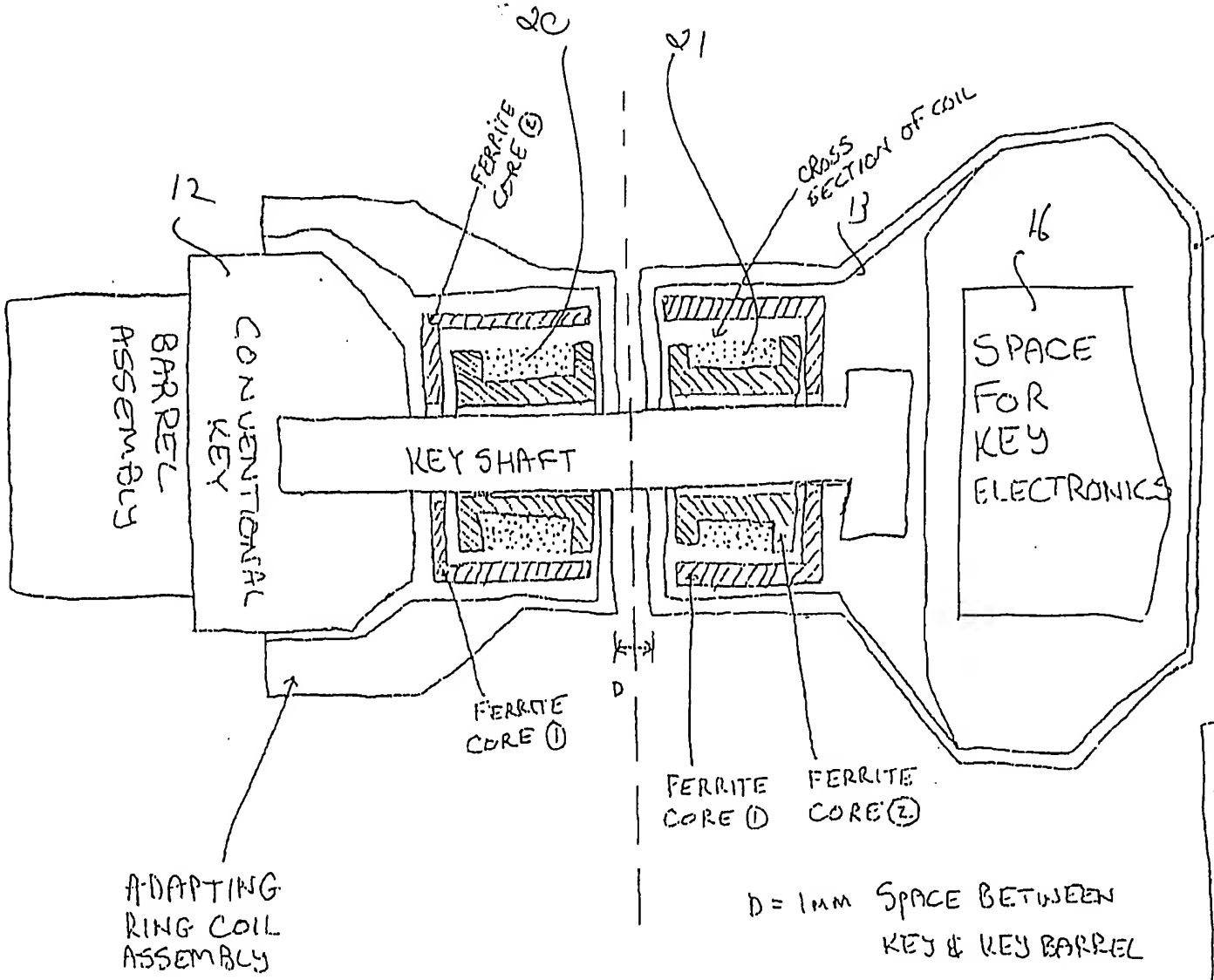


Fig 1

Fig 2



FERRITE CORE TYPE ① = CYLINDRICAL FORM FOR COIL

FERRITE CORE TYPE ② = CYLINDRICAL SHIELD

46 x 44/86

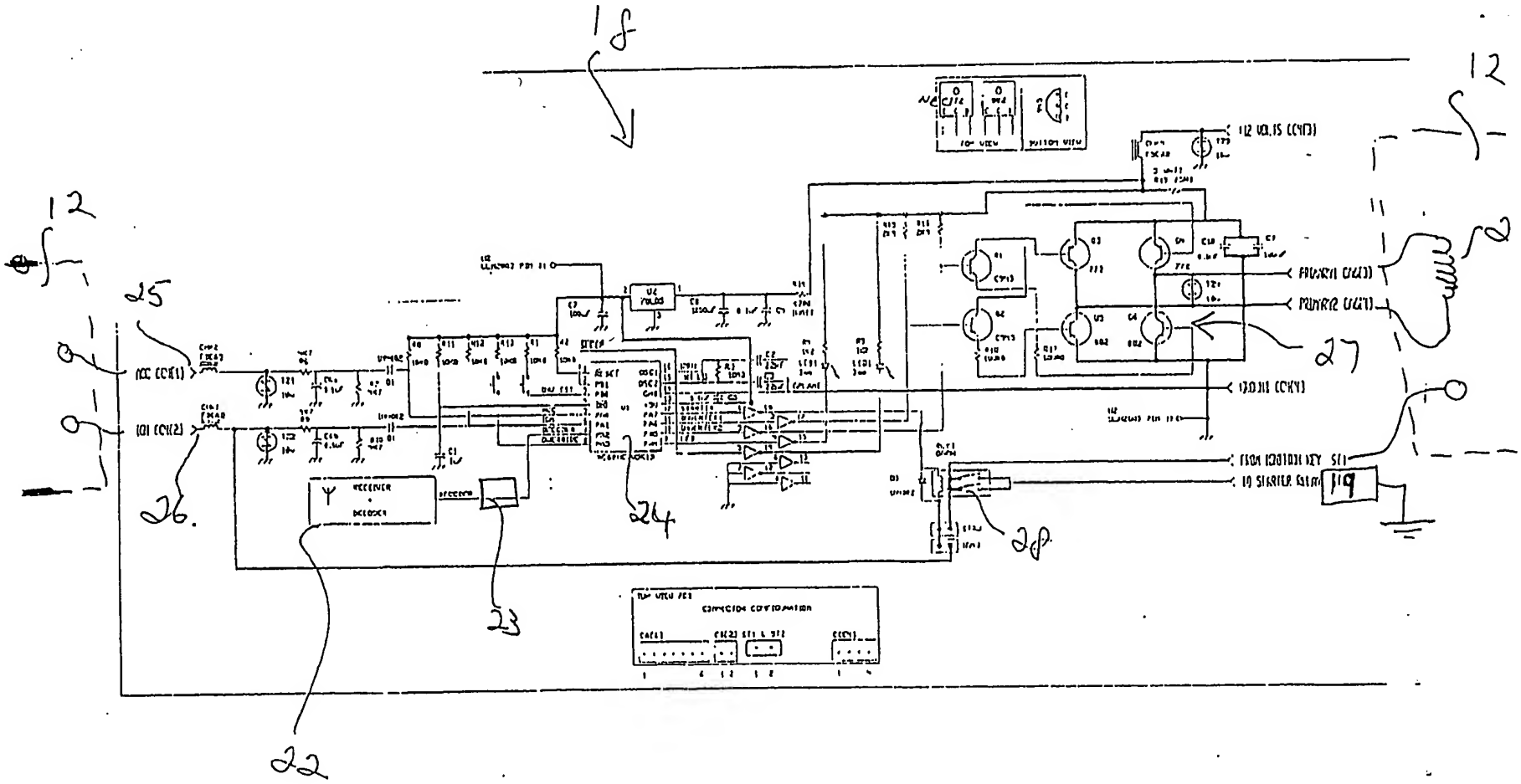

18
12
12
25
26
24
23
22
27
29
19
2
12 VOLTS (CKT3)
ACC (CKT1)
IGN (CKT2)
RECEIVER
DECODER
CONNECTOR CONFIGURATION

Fig 3

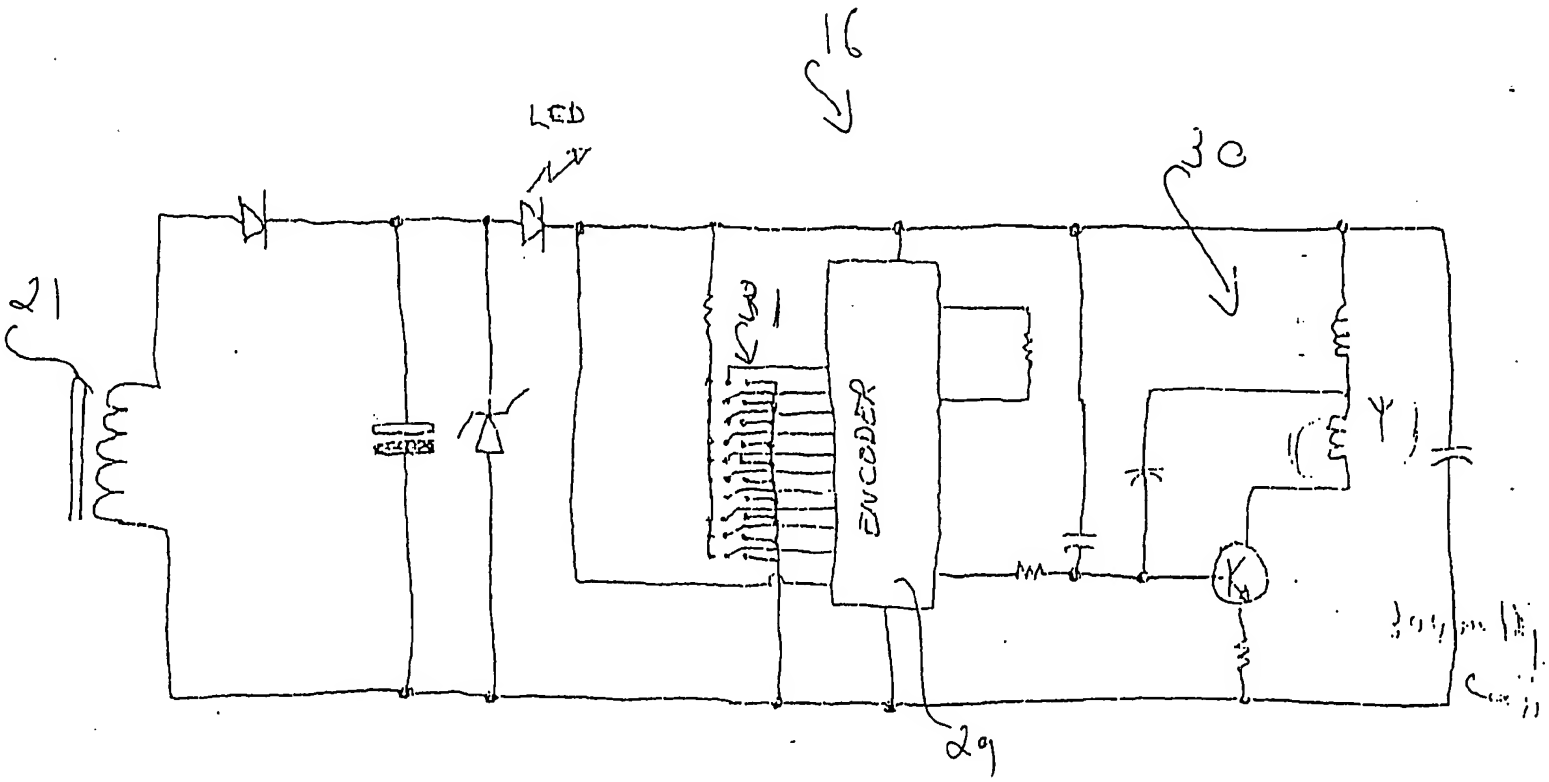


Fig 4

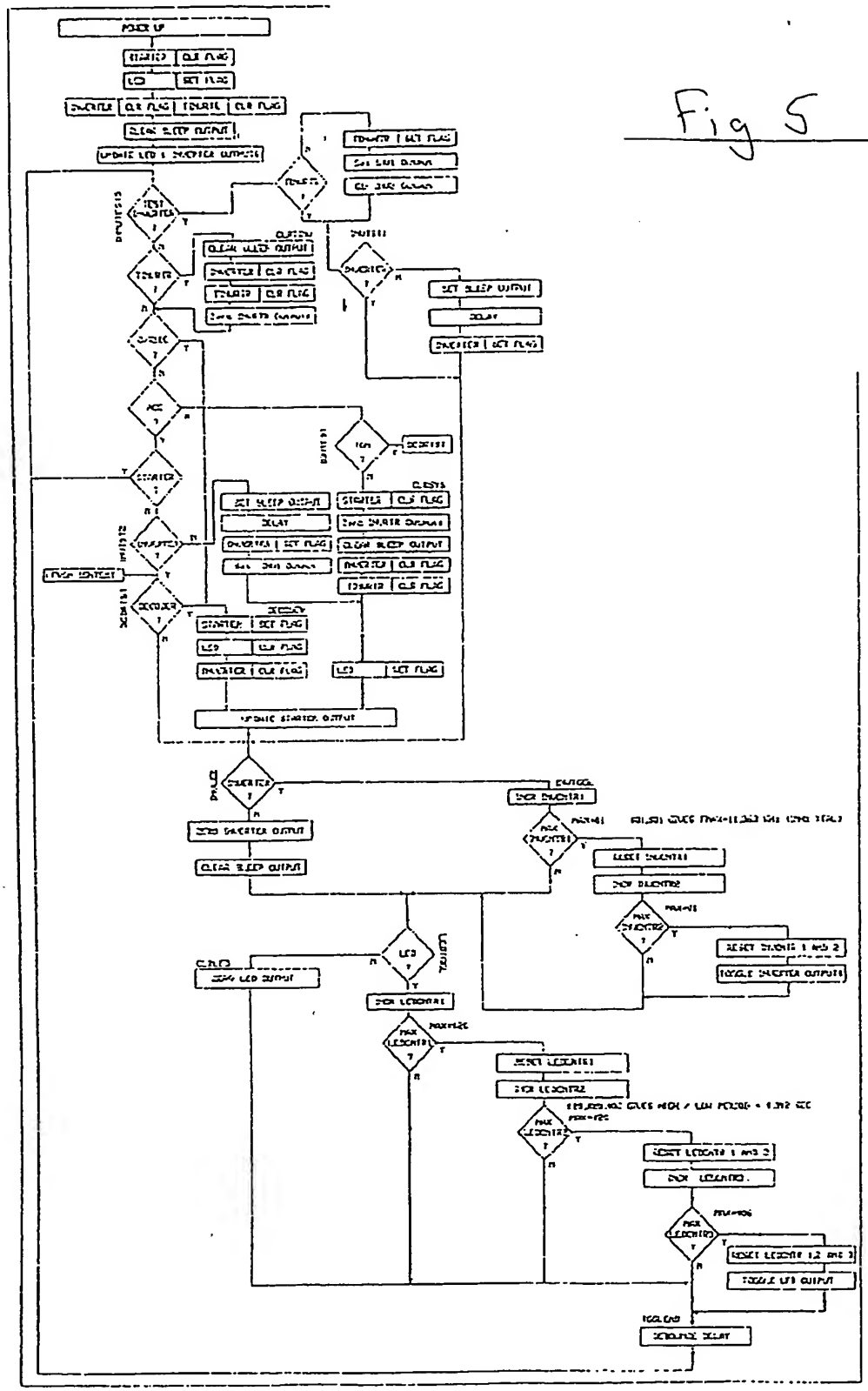


Fig 5